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ABSTRACT

This pamphlet is a guide to the equipment, procedures, instruments, and resources needed in teaching a course of technical typewriting to prepare a typist for a job in a science-related office where correct spelling and use of scientific and technical terminology are of paramount importance. Described are course guidelines, performance objectives, suggested procedures and learning activities, evaluative instruments, and resources for students and teachers. Appendixes include tests on the Greek alphabet, math symbols, spelling, definitions, and word division. (NH)

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AUTHORIZED COURSE OF INSTRUCTION FOR THE QUINMESTER PROGRAM

TECHNICAL TYPEWRITING

Business Education--7705.34 (New: 7766.34)

CE001 882

DADE COUNTY PUBLIC SCHOOLS

DIVISION OF INSTRUCTION • 1971

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TECHNICAL TYPEWRITING

7705.34 (New: 7766.34)

Business Education

Written by Ruth Valenti
And Approved by the Business Education Steering Committee
For Quinmester Courses

for the

DIVISION OF INSTRUCTION
Dade County Public Schools
Miami, FL 33132
1972

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I. COURSE TITLE—TECHNICAL TYPEWRITING

II. COURSE NUMBER—7705.34 (New: 7766.34)

III. COURSE DESCRIPTION

A. Synopsis
A course for the student who desires employment as a typist in a science-related office. Emphasis on rapid and correct typing of scientific expressions with correct spelling and use of scientific and technical terminology, as in electronics or marine science offices.

B. Textbook
One or more of the state adopted textbooks plus any other textbooks of the department's choosing.

C. Occupational Relationships
Technical typist
Technical secretary

IV. COURSE ENROLLMENT GUIDELINES

A. Prior Experiences Needed
All students enrolled in this course should have attained the objectives of Advanced Clerical Typewriting (7705.21) prior to enrollment in this course.

B. Pretest
This test should be used to determine whether the student has attained the objectives of the preceding course and/or the objectives of this course. It should also help the teacher determine individual placement within the class.

V. COURSE OF STUDY PERFORMANCE OBJECTIVES

Upon completion of this course of study, the student will be able to—

1. type a 5-minute timed writing at a minimum of 45 gross words a minute (syllabic intensity of 1.5 or higher) from straight-copy scientific material with a maximum of five errors.

2. type 50 scientific symbols and equations correctly and rapidly;

3. type scientific reports in all three manuscript styles with 100 percent accuracy (corrections allowed) at a minimum speed of 12 net PRAM;

4. type a computer program from a FORTRAN Coding Form with 100 percent accuracy with correct spacing and punctuation;

5. find and list errors occurring in scientific material with 95 percent accuracy;

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V. COURSE OF STUDY PERFORMANCE OBJECTIVES, Continued

6. spell and define 25 scientific terms correctly;

7. set up and type unarranged technical tabulation problems with 95 percent accuracy;

8. divide words and formulas correctly at the ends of lines with 95 percent accuracy; and

9. type and/or draw the mathematical symbols and the Greek alphabet from memory with 80 percent accuracy.

VI. COURSE CONTENT

A. Equipment and Supplies
   1. Basic needs
      a. Typing desk for each student—adjustable
      b. Typewriters—electric (a few manuals are desirable)
      c. Adjustable chair suitable for good typing posture
      d. Textbooks for each student
      e. Demonstration stand and typewriter
      f. Typing paper
      g. Workbook with needed technical and scientific forms
      h. Carbon paper
      i. Correction tape and pencil and ink eraser
      j. Stopwatch and time clock
   2. Supplementary needs
      a. Overhead projector
      b. Filmstrip projector
      c. Record player
      d. Screen
      e. Actual technical and scientific forms contributed by local businesses
      f. Five IBM Selectric typewriters with various technical elements

B. Skill Building
   1. Timed writings (one, three, and five minutes)
      a. Straight copy
      b. Technical copy
      c. Sentence
      d. Paragraph
   2. Speed drills
      a. "Throw-the-carriage"
      b. One-minute typing spurts for speed only
   3. Accuracy drills
      a. Errorless sentences
      b. One-minute drills striving for perfect typing from copy
   4. Reinforcement drills
      a. Balanced hand drills
      b. One-hand drills
      c. Long-word drills
      d. Technical and scientific word drills

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VI. COURSE CONTENT, Continued

e. Technical symbol drills
f. Figures and basic symbol drills
g. Alignment drills
h. Tabulation drills

C. Production of Technical Reports
1. Form
a. Unbound
b. Leftbound
c. Topbound
2. Content
a. Title page
b. Table of contents
c. Footnotes
d. Bibliography
e. Lists of symbols used and/or nomenclature
f. Tables
g. Illustrations—graphs and flow charts
h. Abstract
i. Letter of transmittal

D. Production of Letters and Memorandums
1. Business letters—block and modified block
2. Punctuation—mixed and open
3. Interoffice memorandums
4. Letters containing costs and specifications going to governmental agencies
5. Envelopes
6. Carbon copies

E. Mathematical Symbols and the Greek Alphabet
1. Interchangeable keys available (elements on IBM Selectric)
a. Chemical keyboard (or element)
b. Engineering keyboard (or element)
c. Mathematical keyboard (or element)
d. Weather bureau keyboard (or element)
e. Air navigation keyboard (or element)
2. Typits for use with any standard keyboard
3. Transfer letters such as Letra-set
4. Template use with pen
5. Combination of regular typewriter keys and pen

F. Equations and Formulas
1. Matrices
2. Reaction equations
3. Dot bonds
4. Line bonds
5. Benzene rings
6. Chain formulas
7. Ring formulas
8. Display equations

VI. COURSE CONTENT, Continued

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G. Reports
   1. Technical proposal
   2. Trip report
   3. Progress report

H. Symbols
   1. Fractions
   2. Ellipses
   3. Vinculum
   4. Radicals
   5. Square roots
   6. Vector and tensor notations

I. Review of Acceptability Standards
   1. Rough draft drills
   2. Proofreading drills
   3. Erasing practice drills

J. English-Related Drills
   1. Punctuation and capitalization
   2. Word division and formula division
   3. Spelling and definitions of technical words
   4. Correct use of technical words and terms

VII. SUGGESTED PROCEDURES, STRATEGIES, AND LEARNING ACTIVITIES

A. Course Strategy and Method

The methodology to be utilized should be directed toward training the typist in the previously unexplored technical aspects of typing. Primary emphasis should be on accuracy followed by the building of production rates.

Reinforcement of previous learning is suggested through technique improvement drills, timed writings, practice, demonstrations and performance tests.

Introduction of new material should include sufficient practice material to enable the student to attain a high degree of proficiency and accuracy in the production of technical work. Time limits of varying lengths should be set for production jobs.

The student should be permitted to work at his own rate and to take as long as he needs to satisfy himself and his teacher that he has attained minimum standards for employment.

B. Skill Building

Timed writings should be given on a regular basis so that the student will maintain and/or increase the skill he has previously acquired. Short timings of one minute should be given on

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straight copy, technical copy, sentences, and paragraphs to increase accuracy and speed.

The student's work should be analyzed and proper reinforcement and/or remedial drills should be offered to correct problems in technique. There are some commercial analyzers (such as the Dia-Type Analyzer) to assist in recognizing individual weaknesses.

C. Production of Technical Reports

After the basic form for reports has been reviewed, students should receive training on the parts of technical reports that are unique to this field. Intensive concentration is necessary to train the student in this specialized area.

D. Production of Letters and Memorandums

In the typing of letters and memorandums, emphasis should be placed on mailable letters. Envelopes and the correct number of carbon copies should be typed as a matter of routine. Students will be using the basic styles of letters that have been previously learned. However, the increase in the typing of figures and symbols will increase the necessity for accurate proofreading and typing. Therefore, it is important that the student receives intensive training in this area and understands the necessity for finding and correcting all errors.

On letters containing specifications and information concerning governmental bids and projects, the letters should be set up in a style consistent with federal, state, or local government requirements.

E. Mathematical Symbols and the Greek Alphabet

The student should have available as many as possible of the interchangeable keyboards with a minimum of one week of production work suited to that particular keyboard. If IBM "Selectric" typewriters are being used in the classroom, various elements (or fonts) can be used for the different keyboards.

The student should be familiar with other methods of "making" the mathematical symbols and the Greek alphabet, such as using "typits," transfer letters, templates, and the use of the regular typewriter keys and a pen.

Since the mathematical symbols and the Greek alphabet are "standard" information for technical typists, it is highly recommended that memorization and testing on these symbols be conducted.

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VII. SUGGESTED PROCEDURES, STRATEGIES, AND LEARNING ACTIVITIES, Continued

F. Equations and Formulas

The student should receive intensive practice material typing equations and formulas of all types. Accuracy and neatness are the most important factors to stress. However, occasional speed drills will help the student reach new goals and improve his speed on this difficult type of material.

Emphasis must be placed on the need for absolute accuracy in typing equations, formulas, or technical material since an undetected error could make the formula incorrect, disqualify the manuscript, or cost the company considerable money in finding and correcting the error.

G. English Drills

English-related drills, such as punctuation and capitalization, would be used periodically to reinforce previous learning. It is important to stress correct word division and proper division of formulas.

Spelling and definition tests should be used to acquaint students with the technical vocabulary. Students should also receive training in correct use of technical words and terms and be able to decide on correct terms to use in given sentences.

H. Acceptability Standards

The student should be well trained to correct errors using various corrective devices. Proofreading tests on technical material should continue to be an important, integral part of the student's work. Since much technical matter is written in rough-draft form (rather than dictated), it is vital that typing from rough draft material be included as part of the training program.

VIII. EVALUATIVE INSTRUMENTS

A. Tests

Suggested items for tests may be found in the sample evaluative instruments in the Appendix.

The pretest and posttest should include all of the following types of test items:

TYPE	PURPOSE
Mathematical Symbols Test	To determine if the student can recall the mathematical symbols from memory and construct them correctly.

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VIII. EVALUATIVE INSTRUMENTS, Continued

TYPE	PURPOSE
Greek Alphabet Test	To determine if the student can recall the Greek alphabet from memory and construct the outlines correctly.
Letter Test (including addressing of envelopes)	To determine if the student can type a technical or scientific letter in correct, mailable form.
Tabulation Test	To determine if the student can set up and type (correcting all errors) an unarranged tabulation problem.
Timed Writings	To determine if the student is increasing his speed on straight copy, 5-minute timed writings.
Production Timed Writings	To determine the speed and accuracy of a student in typing problems over an extended period of time (i.e., one hour, one week, etc.)
Spelling Test	To determine if a student can spell scientific and technical words.
Definitions Test	To determine if a student can correctly define scientific and technical words.
Word Division Test	To determine if a student can correctly divide words at the ends of lines.
Scientific Reports Test	To determine if a student can correctly set up and type a scientific report, correcting all errors.

B. Grading

There is no "one" method of grading that is best. It is suggested, however, that there be consistency in grading throughout the course.

All production work should be evaluated on the basis of its relationship to the standards included in the objectives. In grading production tests, it is recommended that net production rate a minute (net PRAM) be used. In order to compute net PRAM, follow these steps:

1. Count all words typed in the problem(s).
2. Subtract 10 for each uncorrected error.
3. Divide this amount by the total minutes.

VIII. EVALUATIVE INSTRUMENTS, Continued

Objective tests (such as spelling and timed writings) may be graded on predetermined standards if desired. Scores also may be placed in rank order and letter grades assigned, using the minimums stated in the objectives for a passing grade.

IX. RESOURCES FOR STUDENTS

A. Textbooks

One or more of the state adopted textbooks for typewriting with one or more of the following:

Adams, Dorothy and Kurtz, Margaret. Typing Practice for the Technical Secretary. New York: Gregg Division of McGraw-Hill Book Co., 1971.

Altholz, Gertrude. Modern Typewriting Practice, 3rd ed. New York: Pitman Publishing Corporation, 1962.

Liles, Parker; Brendel, Leroy A.; and Krause, Ruthetta. Typing Mailable Letters, 2nd ed. New York: Gregg Division of McGraw-Hill Book Co., 1969.

Lojko, Grace K. Typewriting Techniques for the Technical Secretary. Englewood Cliffs: Prentice-Hall, 1972.

Perkins, Edward A.; Reigel, Charles E.; and Lockwood, Mathilda E. Practice for Professional Typewriting. New York: Gregg Division of McGraw-Hill Book Co., 1968.

B. Drill Books, Workbooks, and Practice Sets (Refer to catalogs for current issues)

Bendixen, Ethel T. and Carter, Juanita E. Production Typing, 3rd ed. Cincinnati: South-Western Publishing Co., 1967.

Bowman, Wallace B. Business Letter Typing. Cincinnati: South-Western Publishing Co., 1965.

Fries, Albert C. Timed Writings About Careers. Cincinnati: South-Western Publishing Co., 1963.

Frisch, Handal. Applied Office Typewriting, 3rd ed. (text-workbook) New York: Gregg Division of McGraw-Hill Book Co., 1969.

Grubbs, Robert L. and White, James L. Sustained Timed Writings, 3rd ed. New York: Gregg Division of McGraw-Hill Book Co., 1971.

IX. RESOURCES FOR STUDENTS, Continued

B. Drill Books, Workbooks, and Practice Sets, Continued

Hansen, Beatrice E. Progressive Typing Speed Practice, 3rd ed. New York: Gregg Division of McGraw-Hill Book Co., 1968.

Rowe, John L. and Etier, Faborn. Typewriting Drills for Speed and Accuracy, 3rd ed. New York: Gregg Division of McGraw-Hill Book Co., 1966.

Sass, Esther. Advanced Typing Projects. New York: Pitman Publishing Corporation, 1961.

Thompson, James M. Tabulation Typing. New York: Gregg Division of McGraw-Hill Book Co., 1970.

Wanous, S. J. Statistical Typing with Tabulation Problems, 2nd ed. Cincinnati: South-Western Publishing Co., 1958.

Winger, Fred E. and Weaver, David H. Gregg Tailored Timings (Electric or manual editions). New York: Gregg Division of McGraw-Hill Book Co., 1971. (May be used in the Gregg pacesetter.)

C. Reference Manuals

Abbreviations for Use with ZIP Codes. United States Postal Service, Washington, D. C., 1967.

Chandor, Anthony. A Dictionary of Computers, 3rd edition. Baltimore: Penguin Books, Inc., 1971.

Dunford, Nelson. A Handbook for Technical Typists. New York: Science Publishers, Inc., 1964.

Gavin, Ruth E. and Sabin, William A. Reference Manual for Stenographers and Typists, 4th ed. New York: Gregg Division of McGraw-Hill Book Co., 1970.

Handel, Samuel. A Dictionary of Electronics, 3rd edition. Baltimore: Penguin Books, Inc., 1971.

House, Clifford R. and Koebele, Apollonia M. Reference Manual for Office Personnel, 5th edition. Cincinnati: South-Western Publishing Co., 1970.

House, Clifford. Typewriting Style Manual. Cincinnati: South-Western Publishing Co., 1968.

Laird, Eleanor. The Engineering Secretary's Complete Handbook. Englewood Cliffs: Prentice-Hall, 1962.

IX. RESOURCES FOR STUDENTS, Continued

C. Reference Manuals, Continued

Leslie, Louis. 20,000 Words, 6th edition. New York: Gregg Division of McGraw-Hill Book Co., 1971.

Silverthorn, J. E. and Perry, Devern J. Word Division Manual, 2nd edition. Cincinnati: South-Western Publishing Co., 1970.

Stafford, Alison R. and Culpepper, Billie. The Science-Engineering Secretary. Englewood Cliffs: Prentice Hall, 1963.

Tver, David. Dictionary of Business and Scientific Terms. Houston: Gulf Publishing Co., 1961.

Uvarov, E. B., et. al. A Dictionary of Science, 3rd edition. Baltimore: Penguin Books, Inc., 1971.

X. RESOURCES FOR TEACHERS

A. Books

Teacher's editions, manuals, test booklets, and/or solutions for most of the books listed in Student Resources are available from the publishers.

Crawford, Thomas James. The Effect of Emphasizing Production Typewriting Contrasted with Speed Typewriting in Developing Production Typewriting Ability. Monograph 97. Cincinnati: South-Western Publishing Co., 1960.

Douglas, Lloyd V.; Blanford, James T.; and Anderson, Ruth I. Teaching Business Subjects, 5th ed. Englewood Cliffs: Prentice-Hall, Inc., 1958.

Eddings, Claire Neff. Secretary's Complete Model Letter Handbook. Englewood Cliffs: Prentice-Hall, Inc., 1965.

Guide to Business Education in Florida Schools, A—Bulletin 72. Tallahassee: State Department of Education, 1967.

Krevolin, Nathan. Art Typing, revised ed. New York: Pitman Publishing Corporation, 1965.

Lamb, Marion M. Your First Year of Teaching Typewriting, 2nd ed. Cincinnati: South-Western Publishing Co., 1959.

Lessenberry, D. D. Methods and Materials for Teaching Typewriting. Cincinnati: South-Western Publishing Co., 1962.

X. RESOURCES FOR TEACHERS, Continued

A. Books, Continued

Robinson, Jerry W. Practices and Preferences in Teaching Typewriting. Cincinnati: South-Western Publishing Co., 1969.

Russon, Allien R. and Wanous, S. J. Philosophy and Psychology of Teaching Typewriting, 2nd ed. Cincinnati: South-Western Publishing Co., 1972.

West, Leonard J. Acquisition of Typewriting Skills. New York: Pitman Publishing Corp., 1969.

White, Jane F. and Shank, Bruce C. Teaching Typewriting. Portland: J. Weston Walch, 1964.

B. Periodicals

Balance Sheet, The. Cincinnati: South-Western Publishing Co. Monthly, October through May.

Business Education Forum. Washington, D. C.: National Business Education Association. Publishing monthly.

Business Education World. New York: Gregg Division of McGraw-Hill Book Co. Five publishings each school year.

Journal of Business Education. East Stroudsburg, Pa.: Robert C. Trethaway. Monthly, October through May.

Typewriting News. Cincinnati: South-Western Publishing Co. Semi-annual.

C. Learning Activity Packages

A teacher package with cues, evaluating instruments, and solutions to accompany the student packages is available from Textbook Services, Dade County Public Schools.

D. Tests

Commercially prepared tests correlated with textbooks are available from most publishers.

Mulkerne, Donald and Andrews, Margaret E. Civil Service Tests for Typists. New York: Gregg Division of McGraw-Hill Book Company, 1969.

Typewriting Speed Tests Booklet. (20 five-minute timed writings) (40¢) New York: Gregg Division of McGraw-Hill Book Co.

X. RESOURCES FOR TEACHERS, Continued

D. Tests, Continued

Typewriting Tests. Two sets (W-1 and W-2) of 12 timed writings each (30) copies of each writing. Average syllabic intensity is 1.5—from easy to difficult. Teaching Aids Incorporated, Post Office Box 3527, Long Beach, CA 90803.

Typing Production Test Booklets. (20 tests; 40¢). New York: Gregg Division of McGraw-Hill Book Company.

E. Transparencies

Typing Production (20 visuals) (for promoting efficiency and productivity) Color. Enfield's, 3M Business Systems, 4000 N. W. 30 Avenue, Miami, Florida (633-1551).

Western Publishing Educational Services, 1220 Mound Avenue, Racine, WI 53404, has an assortment of typewriting transparencies including the following:

J8-832—Data Sheet
J8-833—Drawing Lines
J8-797—Tabulated Material
J8-812 through J8-817—Manuscripts
J8-827 through J8-831—Proofreaders' Marks

F. Charts and Posters

Business Teachers Guide, Poster Visual Aids, Dept. W., P. O. Box 114, Conway, NC 03818:

Typing Do's and Duds
Typing Habits, Ugh!
Personality, Ugh!

Eraser Company, Inc., 701 East Washington Street, Syracuse, NY 10013, has a bulletin board chart on all types of envelopes.

G. Bulletin Boards

Bulletin Board Ideas—Typewriting (1961) and Bulletin Board Ideas for Business Classes, 1965 (also through 1970) Supplement. Delta Pi Epsilon, University of Northern Colorado, Greeley, Colorado. ($1.50 each)

Dewar, Thadys J. and White, Jane F. 200 Visual Teaching Ideas, Portland: J. Weston Walch, 1961.

I. Other Aids

Artistic Typing Headquarters, 4006 Carlisle Avenue, Baltimore, MD 21216, has Typewriter Mystery Games, Art Typing, and Deal-a-Grade.

X. RESOURCES FOR TEACHERS, Continued

I. Other Aids, Continued

Teaching-learning aids that are available from South-Western Publishing Company and Gregg Division of McGraw-Hill Book Company:

Certificates of credit and proficiency
Award pins and charms
Progress charts
Rolls of honor

APPENDIX

GREEK ALPHABET TEST

Instructions: Draw the appropriate letter to the right of the Greek name.

Words	Key
1. Zeta	1. Ζ
2. Sigma	2. Σ
3. Omega	3. Ω
4. Mu	4. Μ
5. Alpha	5. Α
6. Xi	6. Χ
7. Upsilon	7. Υ
8. Gamma	8. Γ
9. Kappa	9. Κ
10. Omicron	10. Φ
11. Pi	11. Π
12. Delta	12. Δ
13. Psi	13. Ψ
14. Lambda	14. Λ
15. Beta	15. Β

MATHEMATICAL SYMBOLS TEST

Instructions: Draw the appropriate mathematical symbols to the right of the terms.

Words	Key
1. approaches	1. $\rightarrow$
2. is congruent to	2. $\cong$
3. vinculum	3. $\overline{}$
4. integral	4. $\int$
5. therefore	5. $\therefore$
6. is not greater than	6. $\not>$
7. is identical to	7. $\equiv$
8. infinity	8. ∞
9. is unequal to	9. $\neq$
10. varies directly as	10. $\propto$
11. product	11. $\prod$
12. equiangular	12. $\measuredangle$
13. since	13. $\because$
14. algebraic sum	14. Σ
15. square root; radical	15. $\sqrt{}$
16. arc-minutes	16. $\overset{\frown}{m.n}$
17. is parallel to	17. $\parallel$
18. perpendicular	18. $\perp$
19. partial derivative	19. ∂
20. electrical current; forms and is formed from	20. $\rightleftharpoons$

SPELLING TEST

1. armature
2. sine
3. rectifier
4. flourescent
5. binary
6. matrices
7. parabole
8. spectrum
9. piezoelectric
10. potentiometer
11. spurious
12. elliptic
13. nuolei
14. luminous
15. gyroscope
16. binomials
17. cadmium
18. huclides
19. Einstein
20. roentgen
21. static
22. shear
23. cam
24. biaxial
25. tensile

DEFINITIONS TEST

Instructions: Match the word on the left with the correct definition on the right. Use a separate answer sheet.

1. radiosonde
2. seismograph
3. acceleration
4. spherical aberration
5. bel
6. circuit
7. coalescence
8. calorie
9. dyne
10. kinetic energy
11. malleability
12. incadescent
13. hydration
14. lunar
15. rectifier
16. nebula
17. penstock
18. pipette
19. quantum
20. moderator

A. an instrument for recording the timing of occurrences, duration, direction and intensity of an earthquake

B. a logarithmic expression of the rate of two quantities

C. a unit of force in the C.G.S. system of physical units

D. the rate at which velocity is changing with time

E. power an object has by reason of its motion

F. made luminuous by heat

G. of or pertaining to the moon

H. ability of a material to be hammered or rolled into sheets

I. a defect of lens which causes light near the edge of the lens to focus closer to the lens than that falling near the center

J. a device that allows electrical current to flow—in only one direction through—converting A.C. to D.C.

K. a graduated glass tube used to measure volumes of a liquid

L. a material that slows down neutrons but does not absorb them

M. a device sent into the upper atmosphere by means of a balloon for detecting weather information

N. a path through which an electric current may be established

O. amount of energy associated with electro magnetic waves of a given frequency

P. the amount of heat energy necessary to raise one gram of water one degree C

Q. addition of water

R. a pipe which carries water to a turbine

S. a luminous formation in the heavens resembling a patch of haze

T. act of combining or uniting to form one body, either through chemical affinity, simple mixture, or concentration

U. a positively charged electrode toward which electrons flow in a vacuum

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DEFINITIONS TEST KEY

1. M
2. A
3. D
4. I
5. B
6. N
7. T
8. P
9. C
10. E
11. H
12. F
13. Q
14. G
15. J
16. S
17. R
18. K
19. O
20. L

WORD DIVISION TEST

Instructions: Assume the bell on the typewriter rings at the point at which the word is underscored. Give the first acceptable point of division according to the typewriter rules.

Words	Key
1. anode	1. anode
2. aerosol	2. aero-sol
3. calorie	3. calo-rie
4. coalescence	4. coales-cence
5. absorption	5. absorp-tion
6. diffract	6. dif-fract
7. enthalpy	7. enthalpy
8. satellite	8. sat-ellite
9. impedance	9. imped-ance
10. galaxy	10. galaxy
11. gradient	11. gra-dient
12. molecule	12. mole-cule
13. penumbra	13. penum-bra
14. acceleration	14. accelera-tion
15. nucleus	15. nucleus
16. programmer	16. program-mer
17. specimens	17. speci-mens
18. specification	18. speci-fication
19. lubricant	19. lubri-cant
20. cylindrical	20. cylindri-cal